

SHORT TERM SCIENTIFIC MISSION (STSM) SCIENTIFIC REPORT

This report is submitted for approval by the STSM applicant to the STSM coordinator

Action number: TD 1409 - Mathematics in Industry

STSM title: Research on Computational Mathematics - Participation in Industrial Workshop and in the First Israeli Modelling Week

STSM start and end date: 25/06/2017 to 08/07/2017 (including traveling days)

Grantee name: Vasileios Kostoglou

PURPOSE OF THE STSM:

This STSM visit had two main aims:

- 1) The further development and establishment of research cooperation with distinguished Israeli colleagues (namely Dr A. Gibali and Dr J. Kaminski) in interesting research fields such as mathematical modelling on Intensity-modulated radiation therapy methods, and Information Geometry using statistical analysis respectively.
- 2) The active participation in two important events organized in the framework of MINET project:
 - a) The Industrial Day organized and taken place in Holon Institute of Technology
 - b) the First Israeli Modelling Week organized by ORT Braude College and held in Nahariya.

DESCRIPTION OF WORK CARRIED OUT DURING THE STSM

The main activities and work carried out during my STSM visit are the following (in chronological sequence):

- Meetings with Dr Jeremy Kaminski in Jerusalem and Holon Institute of Technology regarding possible research cooperation in the field of Information Geometry (use of Statistics with Bayesian Analysis and Differential Geometry).
- Visit at Holon Institute of Technology and active participation in the Industrial Day held there on 29.6.2017. Meeting and discussions with members of academic staff.
- Visit at ORT Braude College on 2.7.2017 including discussions with members of academic staff, presentations of research laboratories, and finally the opening ceremony of the Modelling Week.
- Active participation in the whole duration of the First Israel Modelling Week held in Nahariya in the period 2-6.7.2017 - Member of the team that tackled the problem titled "The Carp problem" (optimization problem related with the improvement of the traditional carp cultivating).
- Extensive meetings with Dr Aviv Gibali regarding our established research in the field of Intensity-modulated radiation therapy (IMRT) mathematical methods. Preparatory work on the improvement of IMRT computational methods having been carried out in Greece by Efstathios Antoniou and myself has been brought for these meetings. During the STSM visit the questions that had risen were discussed and opinions were exchanged. Further continuation and plan of research work has been agreed and scheduled.

DESCRIPTION OF THE MAIN RESULTS OBTAINED

The obtained results and benefits from this STSM visit have been the following:

- Further experience in problem formulating and solving by the active participation and contribution in both the Industrial Day and the Modelling Week.
A report has been set up and will be submitted for the mathematical modelling of "The Carp problem", an optimization compound problem concerning the improvement of traditional carp cultivation.
- Getting to know well and cooperate closely in problem solving with distinguished colleagues (namely Wojciech Okrasinski, Hussein Naseraldin, Poul Hjorth, Haggai Katriel and Reinier D. Millán) opening i parallel possibilities of future cooperation.
- Direct research cooperation in the important scientific field of Computational Mathematics and more specificall in the area of mathematical modelling of IMRT computational methods, attempting to solve linear systems with very large number of parameters and equations.
A thorough literatue review has been carried out and the main existing methods have been studied and compared. Attempt to imprrove the existing methods is carried out, possibly through the use of the knowledge of the values of elements by programming some tomography parameters in advance.

FUTURE COLLABORATIONS (if applicable)

The research cooperation in the field of Intensity-modulated radiation therapy (IMRT) mathematical methods will continue aiming to lead to at least a good publication.

Additionally, research cooperation in the field of Information Geometry with the use of Statistics with Bayesian Analysis and Differential Geometry has been discussed and will possibly be carried out.

Future cooperation with colleagues we cooperated during the Modelling Week has been also discussed and will be further examined.